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Joachim Kiefer

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EXAMINER

HU, HENRY S

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/506,646	Applicant(s) KIEFER ET AL.	
	Examiner HENRY S. HU	Art Unit 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Election of August 14, 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-35 is/are pending in the application.
- 4a) Of the above claim(s) 26-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-25 is/are rejected.
- 7) ☒ Claim(s) 16 is/are objected to.
- 8) ☒ Claim(s) 16-35 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is in response to Election filed on August 14, 2008, which is response to Restriction requirement filed on June 13, 2008. **Applicant's Election of Group I, Claims 16-25 is traversed with remarks on pages 2-3.** The traversal is on the ground(s) that no lack of unity objection is raised for PCT application. It would thereby not place an undue burden to search and examine the non-elected Group II (Claims 26-28), Group III (Claims 29-34) and Group IV (Claim 35) with the elected Group I. This is not found persuasive. For instance, Group III is directed to a membrane-electrode assembly, while Group IV is directed to a fuel cell. Each group is dealing with different subject matter. Although the subject matter from each group may comprise the same or similar type proton-conducting polymer membrane, its structure, function and application are indeed different. Particularly, the mixture of Group II may be used for other purpose than polymerization. They are thereby not interchangeable.

2. **The structural elements are mutually exclusive and the search terms are also mutually exclusive, thus they indeed create an undue burden on the Examiner.** The requirement is still deemed proper and is therefore made FINAL. This Application is a **371/PCT/EP03/02398**. It is noted that Applicants' Pre-Amendment and one IDS (3 pages) are filed so far. With such pre-amendment, **original set Claims 1-15 are all cancelled, while new set Claims 16-35 are added. Claims 16-35 with four independent claims** (Claims 16, 26, 29 and 35) are now pending, while non-elected three groups including Group II (Claims 26-

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28), Group III (Claims 29-34) and Group IV (Claim 35) are all withdrawn from consideration by the examiner. An action follows.

Claim Objections

3. **Claim 16 is objected to** because of the following informalities (Applicants may want to correct the specification as well):

On **Claim 16** at line 3, the language as “**mixing a polymer with vinyl-containing phosphonic acid**” may be very confusing. It is unclear that the monomer of vinyl-containing phosphonic acid is inside the polymer or not. Rewriting to “**mixing a monomer of vinyl-containing phosphonic acid with a polymer**” is suggested for better clarification.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

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The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

5. The limitation of parent **Claim 16** in present invention relates to a **proton-conducting polymer membrane based on polyvinylphosphonic acid** obtained by a process comprising the steps:

- (a) mixing a polymer with vinyl-containing phosphonic acid,*
- (b) forming a two-dimensional structure using the mixture of step (a) on a carrier, and*
- (c) polymerizing the vinyl-containing phosphonic acid present in the two-dimensional structure of step (b), and characterized in that the membrane has a thickness in the range from 15 μm to 1000 μm .*

*See other limitations of dependent **Claims 17-25**.*

6. **Claims 16-24** are rejected under 35 U.S.C. 102(e) as being anticipated by **Suzuki et al.** (US 6,607,856 B2 with a foreign priority at November 29, 1999).

Parent **Claim 16** along with its dependent **Claims 17-24** relates to **a process of making a proton-conducting polymer membrane** (to be useful for polymer electrolyte fuel cells, see title) **by using poly(vinylphosphonic acid) with other polymer such as polyazole or**

polysulfone (according to Claim 18). The proton-conducting polymer membrane is obtained from a **three-step** process. For instance, (A) mixing a polymer with vinyl-containing phosphonic acid, (B) forming a two dimensional structure using the mixture of step (a) on a carrier, and (C) polymerizing the vinyl-containing phosphonic acid.

7. **Suzuki** has disclosed the preparation of a **solid polymer electrolyte membrane** in the form as **interpenetrated polymer network** (IPN) to be useful for fuel cell application (see abstract, line 1-13; column 1, line 7-14. The process is shown on **Figure 9** by **polymerization and/or crosslinking a monomer within the polymer chains of an electrolyte membrane** so as to form IPN structure. Attention is directed to the fact that **such a monomer** used in several working examples such as **Examples 1, 3 and 5** can be the claimed **vinylphosphonic acid** (see column 9, line 45-48; column 11, line 61 – column 12, line 7; column 12, line 46 – column 13, line 24), while **such a polymer** can be polyether sulfone (PES) or polyether ether ketone (PEEK) (see working examples 1, 3 and 5).

In comparison with three-step process of parent Claim 1, Suzuki has actually obtained the IPN final product (see Figure 8) by each of **two** different approaches including: (A) by making a polymer blend product by directly mixing poly(vinylphosphonic acid) with other polymer, and (B) by **following the process in Figure 9 as polymerization and/or crosslinking a monomer within the polymer chains of an electrolyte membrane**. Therefore, Suzuki explicitly and/or implicitly anticipates current limitations of parent Claim 16.

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8. Regarding **Claims 17 and 18**, the other polymers as discussed above can be polyether sulfone (PES) or polyether ether ketone (PEEK).

Regarding **Claim 19**, the chemical structure of Suzuki's vinylphosphonic acid monomer reads on at least the first formula and the third formula of Claim 19.

Remaining dependent **Claims 20-24** are thereby rejected with the above discussion.

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. **Claim 25 is rejected** under 35 U.S.C. 103(a) as being unpatentable over **Suzuki et al.** (US 6,607,856 B2) in view of **Gascoyne et al.** (US 2003/0031909 A1).

The discussion of the disclosures of the prior art of Suzuki for Claims 16-24 of this office action is incorporated here by reference. Regarding parent **Claim 25**, Suzuki is only silent of using a proton conducting membrane comprising a layer containing a catalytically active component.

Gascoyne et al. have explicitly taught such a subject matter. For instance, in the course of making proton-conducting membrane to be useful in fuel cell application, the anode electrocatalyst layer is prepared by comprising some level of proton conducting electrolyte in contact with electrocatalyst reaction cites (paragraph 0003, line 1-45; particularly see line 17). By doing so, **such a membrane when assembled into a membrane electrode assembly will allow more water flow in the fuel cell operation** (paragraph 0001, line 7-11).

11. In light of the fact that all involving references are dealing with making proton-conducting membrane for fuel cell application and the proton exchange or proton conductivity is thereby the current key issue. Therefore, one having ordinary skill in the art would have found it obvious to modify Suzuki's process of making a proton-conducting membrane by designing a membrane comprising a layer containing electrocatalyst reaction cites as taught by Gascoyne. Therefore, better and more efficient fuel cell may be obtained since such a membrane when assembled into a membrane electrode assembly will allow more water flow.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicants' disclosure. The following references relate to a proton-conducting polymer membrane based on using the poly(vinylphosphonic acid):

US 2007/0292734 A1 to Kiefer et al. has disclosed a process for producing a proton conducting electrolyte membrane for fuel cell application. It is achieved by **irradiating a polymer film and then "graft"-polymerized a vinylphosphonic acid monomer**. See abstract, line 1-5; Claim 1 at page 16. However, its earliest priority date is **May 10, 2002**, which is later than the priority date of **March 6, 2002** for instant application. Therefore, Kiefer cannot be treated as a prior art reference.

13. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Dr. Henry S. Hu whose telephone number is (571) 272-1103**. The examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Vasu Jagannathan, can be reached on (571) 272-1119. The **fax** number for the organization where this application or proceeding is assigned is **(571) 273-8300** for all regular communications.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Peter D. Mulcahy/
Primary Examiner, Art Unit 1796

/Henry S. Hu/
Examiner, Art Unit 1796

November 9, 2008